

MAP4C

Sec.1.3

Sine, Cosine and Tangent of Obtuse Angles

When point P (x,y) is in Quadrant I, $\angle A$ is an acute angle (ie: between 0° and 90°). The three primary trigonometric ratios Sin A is positive, Cos A is positive and Tan A is positive.

When point P (x,y) is in Quadrant II, $\angle A$ is an obtuse angle (ie: between 90° and 180°). The three primary trigonometric ratios Sin A is positive, Cos A is negative and Tan A is negative.

Investigation:

- Complete the following table. Evaluate each ratio (Sin A, Cos A and Tan A) to 4 decimal places.

Angle A	Sin A	Cos A	Tan A
2°			
5°			
20°			
67°			
79°			
83°			
97°			
101°			
113°			
160°			
175°			
178°			

- Which pairs of angles have the same value for the Sin A. How are these angles related?

2, 178 20, 160 5, 175 add to 180°

- What do you notice about the values of Cos A for the pairs of angles that you identified in the previous question?

One is +, one is -

- What do you notice about the values of Tan A for the pairs of angles that you identified in the previous question?

We can apply these results to any obtuse angle. For example;

$$\sin 150^\circ = \sin 30^\circ \quad \text{b/c } 180 - 150 = 30$$

$$\cos 150^\circ = -\cos 30^\circ$$

$$\tan 150^\circ = -\tan 30^\circ$$

This means that when the Sin of an angle is positive, the angle could be in the first quadrant (ie: acute) or in the second quadrant (ie: obtuse).

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Ex.1: Suppose $\angle C = 157^\circ$. Determine each of the trigonometric ratios for angle C, to 4 decimal places.

$$\sin 157^\circ = __ \sin __^\circ$$

$$\cos 157^\circ = __ \cos __^\circ$$

$$\tan 157^\circ = __ \tan __^\circ$$

Ex.2: Suppose angle A is between 0° and 180° . In each case, state whether angle A is acute or obtuse, or whether two possible angles might exist. Then determine the measure(s) of A to the nearest degree.

a) $\cos A = -\frac{5}{8}$

obtuse

$$A = \cos^{-1}\left(-\frac{5}{8}\right) = 128^\circ$$

b)

$$\sin A = \frac{3}{4}$$

b/c + \Rightarrow 2 answers

$$A = \sin^{-1}\left(\frac{3}{4}\right) = 48^\circ$$

obtuse
 $180 - 48 = 132^\circ$
Acute

Ex.3: Find the following angles;

a) The $\sin P = 0.65$, is angle P acute, obtuse, neither or both? Find the value(s) of angle P?

2 answers!

$$P = \sin^{-1}(0.65) = 40^\circ$$

obtuse
 $180 - 40 = 140^\circ$

b) The $\cos Q = 0.22$, is angle Q acute, obtuse, neither or both? Find the value(s) of angle Q?

$$Q = \cos^{-1}(0.22) = 77^\circ$$

No obtuse!

c) The $\tan R = -0.44$, is angle R acute, obtuse, neither or both? Find the value(s) of angle R?

1 answer \Rightarrow obtuse b/c NEG

$$\tan R = 0.44$$

$$R = \tan^{-1}(0.44) = 24^\circ$$

obtuse
 $180 - 24$
 $R = 156^\circ$